

## 18.

A Spontaneous Epithelioma in the Platyfish,  
*Xiphophorus (Platypoecilus) variatus*.<sup>1</sup>

OLGA ARONOWITZ, ROSS F. NIGRELLI &amp; MYRON GORDON.

*New York Aquarium, New York Zoological Society*<sup>2</sup>.

(Plates I &amp; II; Text-figures 1 &amp; 2).

## INTRODUCTION.

Schlumberger & Lucké (1948), in a review of tumors in cold-blooded vertebrates, reported that papillomas and epitheliomas have been found in a variety of marine and freshwater fishes from different parts of the world. The epitheliomas are of special interest since they show various degrees of malignancy and possess a pattern of growth and histological structure somewhat similar to those found in man (Ewing, 1949; Willis, 1943), in other mammals (Feldman, 1932) and in lower vertebrates.

The present paper is concerned with a description of a single case of a spontaneous epithelioma or epidermoid carcinoma in a laboratory-reared platyfish, *Xiphophorus (Platypoecilus) variatus*. This is the first such case to be reported in the Order Cyprinodontiformes, or killifishes. (The visceral epithelioma described by Raabe, 1939, in *Mollienisia* is not comparable to the tumor in *Xiphophorus*).

## DESCRIPTION.

The epithelioma developed on the dorso-lateral surface of the head, immediately above the operculum, in an adult female specimen measuring 36.25 mm. in standard length and 11.00 mm. in depth. (Text-figs. 1 & 2). The fish was obtained from a laboratory colony the original stock of which was collected in a pool near El Nilo, San Luis Potosi, Mexico, in 1940. Since 1940 hundreds of members of this species, representing 10 generations, were reared, but only one specimen was found (in 1951) with a tumor of this kind.

The tumor measured 5.25 mm. in length, 5.00 mm. in width and 5.25 mm. in height. When first observed, the growth was quite large, smooth, pinkish and sharply circumscribed. After several weeks it developed into a highly vascular nodular structure which hemorrhaged freely when the fish was handled. When the fish became moribund, it

was sacrificed. The parts associated with the tumor were fixed in Bouin's fluid and decalcified in nitric acid and phloroglucin. Paraffin sections were cut at 5 microns and stained with Delafield's hematoxylin-eosin or with Masson's trichrome stain.

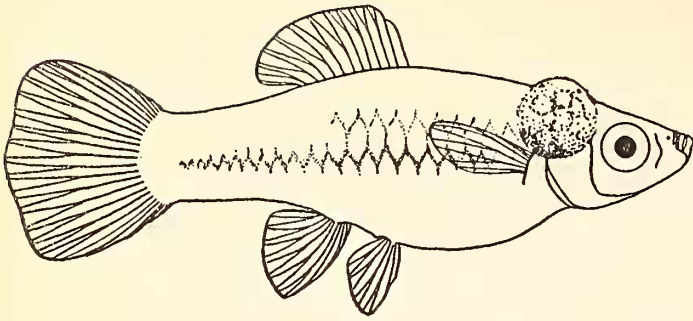
Histologically, the main portion of the tumor was subepidermal and in some regions distinct from the surface epidermis (Pl. I, fig. 1). The epidermis was somewhat thickened but otherwise normal. It contained typical epithelial cells which were interspersed with round and clavate mucus cells. Micromelanophores were numerous at the junction of the epidermis and the subepidermal region. A few were seen scattered in the body of the tumor.

The growth was composed primarily of clusters of small epithelial cells supported by a delicate connective tissue reticulum. No mucus cells, characteristic of the surface epidermis, were found in this region. Although numerous capillaries were present there was only a mild inflammatory reaction as evidenced by the presence of a few macrophages and other leucocytes localized in certain peripheral areas of the growth. Cells somewhat similar to those identified in normal tissues in other fish species by Duthie (1939) and Catton (1951) as coarse granulocytes in the discharging state were seen scattered in the connective tissue in regions below the epidermis (Pl. II, fig. 5). These cells were oval or pear-shaped; the former measured about  $8 \times 4$  microns and contained club-shaped inclusions which stained red with Masson's method. The function of these cells, if they are the same as those described by the above investigators, has not been definitely established. Catton (1951) "proposed that the 'granules' are in reality vesicles with fluid contents, which are ultimately discharged at epithelial surfaces."

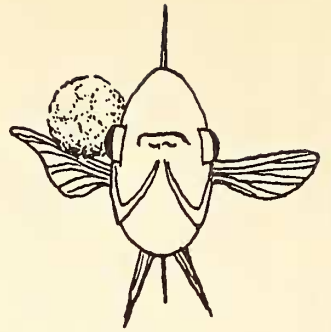
The epithelial elements of the tumor were small cells of various shapes with scanty cytoplasm and with nuclei that appeared normal. Mitotic stages were frequently encountered. Occasionally, concentric groups of these cells were flattened by pressure which apparently produced pearl-like structures (Pl. I, fig. 2). No cornification occurred,

<sup>1</sup> Supported by a grant from the National Cancer Institute, National Institutes of Health, Public Health Service.

<sup>2</sup> From the Genetics Laboratory of the New York Zoological Society at the American Museum of Natural History, New York 24, N. Y.



TEXT-FIG. 1. Lateral view of the *Xiphophorus (Platypoecilus) variatus* female, showing the extent of the spontaneous epithelioma which developed above the operculum. The surface of the tumor was nodular and vascular. 3X.



TEXT-FIG. 2. Frontal view of the *Xiphophorus (Platypoecilus) variatus* female, showing the spherical outline of spontaneous epithelioma, 3X.

however, since the epithelium of the skin of fishes does not form keratin. In some areas a few large binucleate and multinucleate cells with distinct pale-staining vesicular nuclei containing one or more nucleoli were present (Pl. I, fig. 3). These might be syncytial cells, which are sometimes seen in certain tumor processes.

Some evidence of malignancy was found in the tumor. The cells had completely replaced the original corial tissue, and in the posterior part of the growth they had penetrated the limiting membranes and invaded the muscle tissue near the operculum (Pl. II, fig. 4). The muscle fibers in this region were disoriented and hyalinized. No evidence of metastasis was found. From this evidence, it seems appropriate to classify this tumor as a malignant non-metastatic epidermoid carcinoma.

In the course of the examination of the other organs and tissues of the body, it was found that, in addition to the epithelioma, the fish had an enlarged thyroid which was similar in histological structure to the thyroid tumors reported in a related species, *Xiphophorus montezumae*, by Gorbman & Gordon (1951). The presence of two distinct types of tumors at the same time is exceptionally rare in fish and in other animals. (Two kinds of pigment cell tumors were described recently in a group of genetically related fishes by Nigrelli, Jakowska & Gordon, 1951). In the present case there was no apparent relationship between the thyroid tumor and the epithelioma.

#### DISCUSSION.

Schlumberger & Lucké (1948) revealed considerable confusion in published reports concerning the differentiation of papillomas and epitheliomas in fishes. In their review on this subject they had placed certain tumors which were described "as epitheliomas under the heading of papilloma because of their structure and absence of invasion." It should be indicated, however, that fish tumors grow very slowly and it is not always

possible to differentiate these two types of growths on the basis of invasiveness. In this connection, Willis (1948) stated that in humans, "Epidermoid carcinomas of the skin differ widely in their invasiveness. Many of them are of relatively low malignancy, growing and penetrating the underlying tissues only slowly; and no sharp distinction between papillomas and these chronic carcinomas can be made." This statement may also apply to similar tumors in the skin of fishes.

#### SUMMARY.

A spontaneous, malignant, non-metastatic epithelioma (epidermoid carcinoma) was found in the head region of a laboratory-bred female platyfish, *Xiphophorus (Platypoecilus) variatus*. The tumor was similar in many respects to the skin epitheliomas of mammals and other vertebrates. This is the first case of such a tumor from a fish belonging to the Order Cyprinodontiformes.

#### ACKNOWLEDGEMENTS.

The authors thank Dr. William N. Tavolga and Mr. James W. Atz for reading the manuscript, Mr. Donn E. Rosen for drawing the text-figures, and the American Museum of Natural History for laboratory facilities.

#### REFERENCES.

- CATTON, W. T.  
1951. Blood cell formation in certain teleost fishes. *Blood, Jour. Hematol.*, 6(1): 39-60.
- DUTHIE, E. S.  
1939. The origin, development and function of the blood cells in certain marine teleosts. Part 1, *Morphology. Jour. Anat.*, 73: 396-412.
- EWING, JAMES  
1940. *Neoplastic diseases*. W. B. Saunders Co., Philadelphia, Penna., i-xii, 1160 pp.

## FELDMAN, WILLIAM H.

1932. Neoplasms of domesticated animals. W. B. Saunders Co., Philadelphia, Penna., 410 pp.

## GORBMAN, AUBREY &amp; MYRON GORDON

1951. Spontaneous thyroïdal tumors in the swordtail, *Xiphophorus montezumae*. *Cancer Research*, 11(3): 184-187.

## NIGRELLI, R. F., SOPHIE JAKOWSKA &amp; MYRON GORDON

1951. The invasion and cell replacement of one pigmented neoplastic growth by a second, and more malignant type in experimental fishes. *Brit. Jour. Cancer*, 5: 54-68.

## RAABE, HENRYK

1939. Cas d'epithelioma des viscères chez le poisson *Mollienisia velifera* Reg. *Arch. Zool. Exp. et Générale*, 81(1): 1-8.

## SCHLUMBERGER, H. G. &amp; BALDUIN LUCKÉ

1948. Tumors of fishes, amphibians and reptiles. *Cancer Research*, 8(12): 657-754.

## WILLIS, R. A.

1948. Pathology of tumors. The C. V. Mosby Company, St. Louis, Mo., i-xxiii, 992 pp.

## EXPLANATION OF THE PLATES.

## PLATE I.

- Fig. 1. Cross-section of the *Xiphophorus (Platypoecilus) variatus* female at the level of the gills. The extent of the spontaneous epithelioma can be seen to the left. At this level no invasion of the underlying musculature can be seen. Magnification approximately 18 $\times$ .
- Fig. 2. Section through the anterior portion of the epithelioma. A metaphase plate can be seen in the center of the field. Magnification approximately 600 $\times$ .
- Fig. 3. Section through the center of the epithelioma, showing a multinucleate giant cell upper right, and an incipient pearl formation lower right. Magnification approximately 600 $\times$ .

## PLATE II.

- Fig. 4. Posterior portion of the epithelioma. The center of the field shows muscle fibers surrounded and separated by invading epithelioma cells. Magnification approximately 280 $\times$ .
- Fig. 5. Lateral portion of the epithelioma just below the epidermal covering, showing the cells described by Catton (1951) as coarse granulocytes in a discharging state. The cells can be recognized by their club-shaped inclusions. The vesicle usually seen at the blunter end of the cell cannot be seen in these preparations. Magnification approximately 1050 $\times$ .